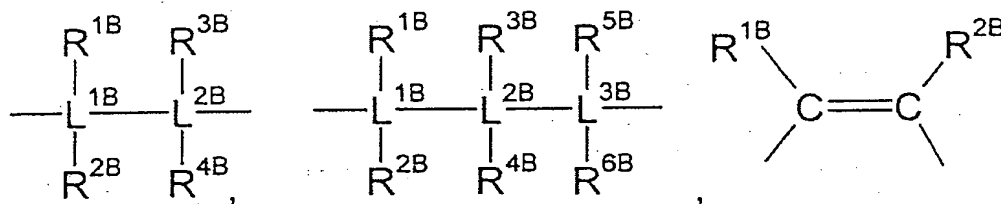


We claim:

1. A monocyclopentadienyl complex which contains the structural feature of the formula $(Cp)(-Z-A)_mM$ (I), where the variables have the following meanings:

Cp is a cyclopentadienyl system,

Z is a bridge between A and Cp and is selected from the group consisting of



where

$L^{1B}-L^{3B}$ are each, independently of one another, carbon or silicon,

$R^{1B}-R^{6B}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{7B}_3 , where the organic radicals $R^{1B}-R^{6B}$ may also be substituted by halogens and two geminal or vicinal radicals $R^{1B}-R^{6B}$ or a radical $R^{1B}-R^{6B}$ and A may also be joined to form a five- or six-membered ring and

R^{7B} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{7B} may also be joined to form a five- or six-membered ring,

A is an unsubstituted, substituted or fused, heteroaromatic ring system,

M is a metal selected from the group consisting of titanium in the oxidation state 3, vanadium, chromium, molybdenum and tungsten and

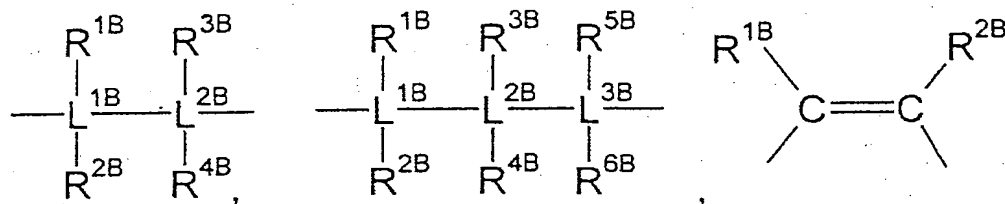
m is 1, 2 or 3.

2. A monocyclopentadienyl complex as claimed in claim 1 of the formula $(Cp)(-Z-A)_mMX_k$ (V), where the variables have the following meanings:

Cp is a cyclopentadienyl system,

Z is a bridge between A and Cp and is selected from the group consisting of

5



where

$\text{L}^{1\text{B}}\text{--L}^{3\text{B}}$ are each, independently of one another, carbon or silicon,

10 $\text{R}^{1\text{B}}\text{--R}^{6\text{B}}$ are each, independently of one another, hydrogen, $\text{C}_1\text{--C}_{20}$ -alkyl, $\text{C}_2\text{--C}_{20}$ -alkenyl, $\text{C}_6\text{--C}_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or $\text{SiR}^{7\text{B}}_3$, where the organic radicals $\text{R}^{1\text{B}}\text{--R}^{6\text{B}}$ may also be substituted by halogens and two geminal or vicinal radicals $\text{R}^{1\text{B}}\text{--R}^{6\text{B}}$ may also be joined to form a five- or

15 six-membered ring and

$\text{R}^{7\text{B}}$ are each, independently of one another, hydrogen, $\text{C}_1\text{--C}_{20}$ -alkyl, $\text{C}_2\text{--C}_{20}$ -alkenyl, $\text{C}_6\text{--C}_{20}$ -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals $\text{R}^{7\text{B}}$ may also be joined to form a five- or six-membered ring,

20

A is an unsubstituted, substituted or fused, heteroaromatic ring system,

M is a metal selected from the group consisting of titanium in the oxidation state 3, chromium, molybdenum and tungsten,

25

m is 1, 2 or 3,

X are each, independently of one another, fluorine, chlorine, bromine, iodine, hydrogen, $\text{C}_1\text{--C}_{10}$ -alkyl, $\text{C}_2\text{--C}_{10}$ -alkenyl, $\text{C}_6\text{--C}_{20}$ -aryl, alkylaryl having 1-10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^1R^2 , OR^1 , SR^1 , SO_3R^1 , OC(O)R^1 , CN, SCN, β -diketonate, CO, BF_4^- , PF_6^- or a bulky noncoordinating anion,

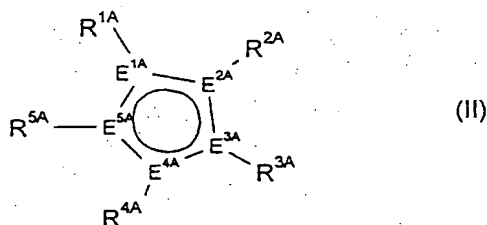
30

R^1-R^2 are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, SiR^3_3 , where the organic radicals R^1-R^2 may also be substituted by halogens and two radicals R^1-R^2 may also be joined to form a five- or six-membered ring,

R^3 are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^3 may also be joined to form a five- or six-membered ring and

k is 1, 2 or 3.

3. A monocyclopentadienyl complex as claimed in claim 1 or 2, wherein the cyclopentadienyl system Cp has the formula (II):



where the variables have the following meanings:

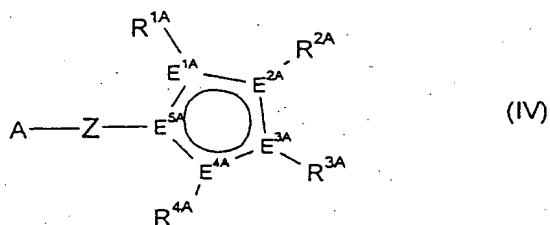
$E^{1A}-E^{5A}$ are each carbon or not more than one E^{1A} to E^{5A} is phosphorus,

$R^{1A}-R^{5A}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2 , $N(SiR^{6A}_3)_2$, OR^{6A} , $OSiR^{6A}_3$, SiR^{6A}_3 , BR^{6A}_2 , where the organic radicals $R^{1A}-R^{5A}$ may also be substituted by halogens and two vicinal radicals $R^{1A}-R^{5A}$ may also be joined to form a five- or six-membered ring, and/or two vicinal radicals $R^{1A}-R^{5A}$ are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S, and where 1, 2 or 3 substituents $R^{1A}-R^{5A}$ is a group -Z-A and

R^{6A} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical and two geminal radicals R^{6A} may also be joined to form a five- or six-membered

ring.

4. A monocyclopentadienyl complex as claimed in any of claims 1 to 3, wherein the cyclopentadienyl system Cp together with -Z-A has the formula (IV):



where the variables have the following meanings:

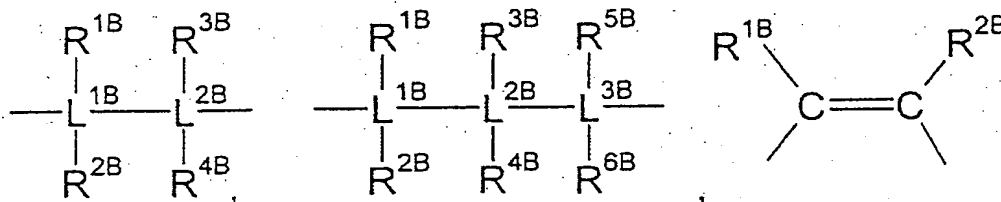
$E^{1A}-E^{5A}$ are each carbon or at most one E^{1A} to E^{5A} is phosphorus,

$R^{1A}-R^{4A}$ are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2 , $N(SiR^{6A}_3)_2$, OR^{6A} , $OSiR^{6A}_3$, SiR^{6A}_3 , where the organic radicals $R^{1A}-R^{4A}$ may also be substituted by halogens and two vicinal radicals $R^{1A}-R^{4A}$ may also be joined to form a five- or six-membered ring, and/or two vicinal radicals $R^{1A}-R^{4A}$ may be joined to form a heterocycle containing at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring.

A is an unsubstituted, substituted or fused, heteroaromatic ring system,

Z is a bridge between A and Cp and is selected from the group consisting of



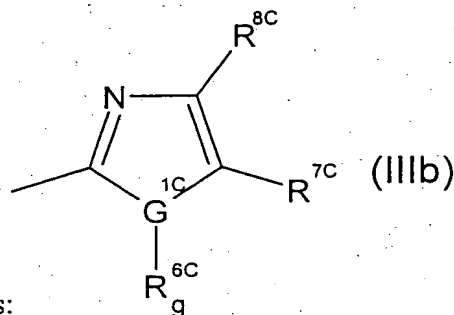
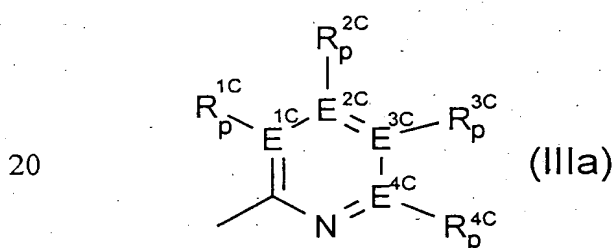
where

$L^{1B}-L^{3B}$ are each, independently of one another, carbon or silicon,

$R^{1B}-R^{6B}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{7B}_3 , where the organic radicals $R^{1B}-R^{6B}$ may also be substituted by halogens and two geminal or vicinal radicals $R^{1B}-R^{6B}$ may also be joined to form a five- or six-membered ring and

R^{7B} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{7B} may also be joined to form a five- or six-membered ring.

5. A monocyclopentadienyl complex as claimed in any of claims 1 to 4, wherein A has the formula (IIIa) or (IIIb):



where the variables have the following meanings:

25 $E^{1C}-E^{4C}$ are each carbon or nitrogen,

$R^{1C}-R^{4C}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3 , where the organic radicals $R^{1C}-R^{4C}$ may also be substituted by halogens or nitrogen and further C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3 groups and two vicinal radicals $R^{1C}-R^{4C}$ or R^{1C} and Z may also be joined to form a five- or six-membered ring and

35 R^{5C} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals

R^{5C} may also be joined to form a five- or six-membered ring and

p is 0 when $E^{1C}-E^{4C}$ is nitrogen and 1 when $E^{1C}-E^{4C}$ is carbon,

5 G^{1C} is nitrogen, phosphorus, sulfur or oxygen,

$R^{6C}-R^{8C}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{9C}_3 , where the organic radicals $R^{6C}-R^{8C}$ may also be substituted by halogens or nitrogen and further C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{9C}_3 groups and two vicinal radicals $R^{6C}-R^{8C}$ or R^{6C} and Z may also be joined to form a 5- or 6-membered ring and

15 R^{9C} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{9C} may also be joined to form a five- or six-membered ring and

20 g is 0 when G^{1C} is sulfur or oxygen and 1 when G^{1C} is nitrogen or phosphorus.

25 6. A monocyclopentadienyl complex as claimed in any of claims 1 to 5, wherein Z is selected from the group consisting of $-C(R^{1B}R^{2B})-Si(R^{3B}R^{4B})-$, $-CH_2-C(R^{3B}R^{4B})-$ and 1,2-phenylene.

7. A catalyst system for olefin polymerization comprising

30 A) at least one monocyclopentadienyl complex as claimed in claims 1 to 6,

B) optionally, an organic or inorganic support,

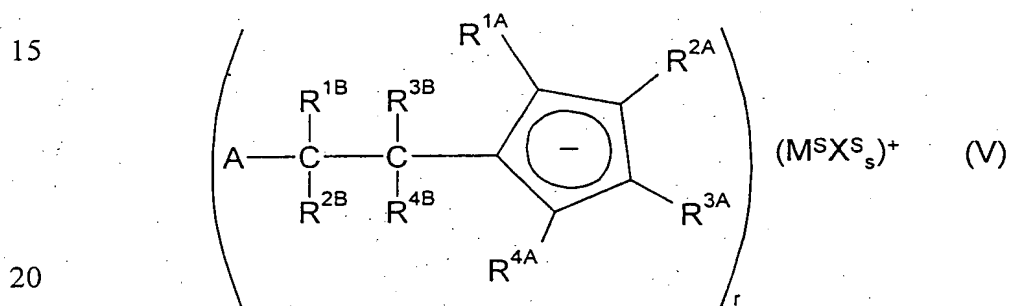
C) optionally, one or more activating compounds,

35 D) optionally, further catalysts suitable for olefin polymerization and

E) optionally, one or more metal compounds containing a metal of group 1, 2 or

13 of the Periodic Table.

8. A prepolymerized catalyst system comprising a catalyst system as claimed in claim 7 and one or more linear C₂-C₁₀-1-alkenes polymerized onto it in a mass ratio of from 1:0.1 to 1:1 000 based on the catalyst system.
9. The use of a catalyst system as claimed in claim 7 or 8 for the polymerization or copolymerization of olefins.
10. A process for preparing polyolefins by polymerization or copolymerization of olefins in the presence of a catalyst system as claimed in claim 7 or 8.
11. A process for preparing cyclopentadienyl systems of the formula (V):



where the variables have the following meanings:

R^{1A}-R^{4A} are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}₂, N(SiR^{6A}₃)₂, OR^{6A}, OSiR^{6A}₃, SiR^{6A}₃, where the organic radicals R^{1A}-R^{4A} may also be substituted by halogens and two vicinal radicals R^{1A}-R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A}-R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S.

R^{6A} are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

A is an unsubstituted, substituted or fused, heteroaromatic ring system,

R^{1B} - R^{4B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{7B}_3 , where
 5 the organic radicals R^{1B} - R^{4B} may also be substituted by halogens and two geminal vicinal radicals R^{1B} - R^{4B} may also be joined to form a five- or six-membered ring and

10 R^{7B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{7B} may also be joined to form a five- or six-membered ring,

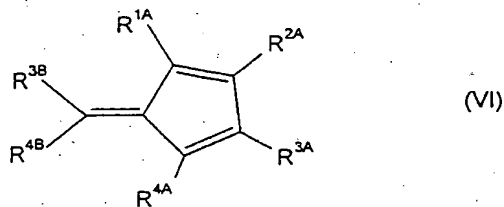
15 M^S a metal of group 1, 2 or 3 of the Periodic Table of the Elements,

20 X^S are each, independently of one another, fluorine, chlorine, bromine, iodine, hydrogen, C_1 - C_{10} -alkyl, C_2 - C_{10} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having 1-10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^1R^2 , OR^1 , SR^1 , SO_3R^1 , $OC(O)R^1$, CN , SCN , β -diketonate, CO , BF_4^- , PF_6^- or a bulky noncoordinating anion and

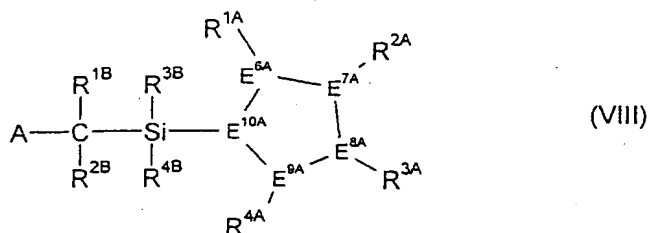
s 0, 1 or 2,

25 r 1 or 2, with the proviso that $s + r$ is the oxidation state of $M^S - 1$,

which comprises reacting $(A-CR^{1B}R^{2B})_r(M^SX^S)_s^+$ with a fulvene of the formula (VI)



30 12. A process for preparing cyclopentadienyl systems of the formula (VIII):



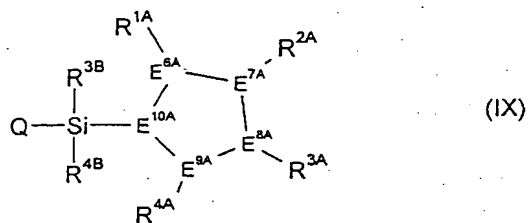
where the variables have the following meanings:

- 5 $E^{6A}-E^{10A}$ are each carbon or not more than one E^{6A} to E^{10A} is phosphorus, where four adjacent $E^{6A}-E^{10A}$ form a conjugated diene system and the remaining $E^{6A}-E^{10A}$ additionally bears a hydrogen atom,
- 10 $R^{1A}-R^{4A}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2 , $N(SiR^{6A}_3)_2$, OR^{6A} , $OSiR^{6A}_3$, SiR^{6A}_3 , where the organic radicals $R^{1A}-R^{4A}$ may also be substituted by halogens and two vicinal radicals $R^{1A}-R^{4A}$ may also be joined to form a five- or six-membered ring, and/or two vicinal radicals $R^{1A}-R^{4A}$ are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,
- 15 R^{6A} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,
- 20 A is an unsubstituted, substituted or fused, heteroaromatic ring system,
- 25 $R^{1B}-R^{4B}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{7B}_3 , where the organic radicals $R^{1B}-R^{4B}$ may also be substituted by halogens and two geminal or vicinal radicals $R^{1B}-R^{4B}$ may also be joined to form a five- or
- 30 six-membered ring, and
- R^{7B} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals

R^{7B} may also be joined to form a five- or six-membered ring,

which comprises reacting $(A-CR^{1B}R^{2B-})_r(M^S X^S)_s^+$ with a cyclopentadienyl system of the formula (IX)

5



where the variables are as defined above and

10 Q is a leaving group.